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SIEMENS CORPORATION
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EXAMINER	
SANDERS, JAMES M	

ART UNIT	PAPER NUMBER
1791	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/551,740	BEECK ET AL.	
	Examiner	Art Unit	
	JAMES SANDERS	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17,18 and 21-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17,18 and 21-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 September 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

This is a final Office action in response to a non-final Office action reply filed 11/13/09, in which claim 17 was amended and claim 20 was cancelled.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 17-18, 21-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deckard (US 4863538, already of record), further in view of Sachs et al (US 5340656), and further in view of Lewis et al (US 5837960, already of record).

For claim 17, Deckard teaches a process for producing a shaped object from a powder bed, comprising: preparing a powder bed having a first powder mix in a first

region and forming a first region of the shaped object by a first laser sintering of the first powder mix (Figs. 1 & 2, cl 5 ln 64 to cl 6, ln 2).

Deckard does not teach a second powder mix in a second region, the first and second powder mixes differing from each other in at least one of chemical composition and powder particle size distribution, and forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix.

However, in the same field of endeavor pertaining to producing a shaped object from a powder bed, Sachs et al teach a second powder mix in a second region, the first and second powder mixes differing from each other in at least one of chemical composition and powder particle size distribution (cl 11 lns 15-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Sachs et al with those of Deckard for benefit of producing shaped objects with regions of different materials.

Further, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, since one having ordinary skill in the art at the time the invention was made would recognize this limitation as nothing more than the duplication of parts for a multiple effect and could seek the benefit of producing shaped objects with regions formed of different materials. Please see MPEP 2144.04 (VI) and In re Harza, 274 F.2d 669, 671, 124 USPQ 378, 380 (CCPA 1960) for further details.

The previous combination does not teach the forming of at least one of the first and second regions comprises controlling the respective laser sintering step to provide different material properties in the first and second regions of the shaped object, and controlling a laser beam generated during the first and second laser sintering processes to produce a different sintering temperature over the first and second regions of the object creating a different degree of densification in the first and second regions of the shaped object.

However, in a related field of endeavor pertaining to producing a shaped object from a powder with directed light, Lewis et al teach the forming of at least one of the first and second regions comprises controlling the respective laser sintering step to provide different material properties in the first and second regions of the shaped object (cl 4 lns 20-21 i.e. Another object is to produce articles having variable density, and cl 22 lns 1-8 i.e. Decreasing laser power results in less melting of the powder, thus reducing density, and cl 21 lns 14-22 i.e. It is expected that smoother surfaces will be attained by use of powder of smaller size and by reducing the size of the powder spot. Rough surfaces might also be smoothed by laser ablation, using the laser in a pulsed mode to remove small amounts of material, or by passing the laser beam over the surface in order to melt a very thin surface layer). Examiner points out that as densification is controlled it is inherent that porosity is also controlled and vice versa. As cited above, Lewis et al teach that the melting is not necessarily complete and Examiner considers that the incomplete melting is equivalent to “sintering.” Lewis et al further teach controlling a laser beam generated during the first and second laser sintering processes to produce a

different sintering temperature over the first and second regions of the object creating a different degree of densification in the first and second regions of the shaped object. (cl 22 lns 1-5 i.e. An article whose density varies, that is, has different densities at different locations, may be formed by varying laser power...Decreasing laser power results in less melting of the powder, thus reducing density). It is inherent that areas subjected to different laser powers would have different temperatures. Also, Lewis et al teach different laser power levels for each material based on melting points (cl 17 lns 17-20)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lewis et al with those of the previous combination for benefit of producing shaped objects with regions of more widely varying different material properties.

For claim 18, the previous combination does not teach a ceramic mold is formed.

However, Lewis et al teach a process for producing a ceramic shaped object from ceramic powder (cl 1 lns 21-22 i.e. The present invention may be used to produce articles of any material which is obtainable in the form of a powder, and cl 21 lns 40-44 i.e. For example, turbine blades...might be fabricated...as the tip portion of the blade is formed, using an abrasion resistant material, such as carbide, boride..., and cl 21 lns 56-57 i.e. a hacksaw blade may be coated with tungsten carbide in the toothed section of the blade). Lewis et al do not explicitly teach a ceramic mold is formed, but they do teach fabrication of dies (cl 4 lns 8-9) and fabrication of fixtures for use in conventional high-volume production of articles (cl 4 lns 9-10) and since a mold is an alternative for a die and because a mold can be used many times, fabrication of a mold having regions

with dissimilar properties would have been obvious to one having ordinary skill in the art at the time the invention was made.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lewis et al with those of the previous combination for benefit of producing a particular kind of shaped object with recognized utility for repeated production of articles.

For claim 21, Deckard teaches post formation treatments including heat treatment for the objects produced (cl 6 ln 55 to cl 7 ln 2 i.e. some type of parts may require certain material properties which can be achieved by heat treating).

Also, Lewis et al teach an operative principle that the amount of heat applied influences density (cl 22 lns 7-8 i.e. The operative principle is that a reduction in heat input per unit of mass causes a reduction in density) so that an increase in heat input per unit of mass causes an increase in density. Further, Lewis et al teach an increased density of hot-pressed powder compared to cold-pressed powder (cl 13 lns 9-11 i.e. that of cold-pressed powder is usually about 50 to 55% (of theoretical density of the material) and that of hot-pressed powder is usually 80% or more).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lewis et al with those of the previous combination for benefit of achieving further densification by hot isostatic pressing.

For claim 22, Deckard teaches accessing a computerized representation of the object and using the computerized representation to control the process for producing the shaped object (cl 6 lns 36-49).

For claims 23 and 24, further regarding a ceramic mold is formed taught as obvious by Lewis et al above, Lewis et al do not explicitly teach the first region of the ceramic mold to comprise a shell and the second region of the ceramic mold to comprise a core disposed in a cavity of the shell, or the first region of the ceramic mold comprises an inner region and the second region of the ceramic mold comprises an outer region and the process is controlled so that the inner region is denser than the outer region of the mold. However, they do teach a method of fabrication of dies and fabrication of fixtures for use in conventional high-volume production of articles (see citations for claim 18 above) that is capable of forming a mold having these specific features and that would have been obvious to one having ordinary skill in the art at the time the invention was made.

For claims 25 and 26, the previous combination does not teach using powder grain sizes of less than 30 micrometers.

However, Lewis et al teach using powder grain sizes of less than 30 micrometers (cl 13 lns 13-15 i.e. Powder sizes used in making articles with the three axis apparatus ranged from about 270 mesh (0.025 mm = 25 micrometers) to about 100 mesh (0.149 mm = 149 micrometers).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Lewis et al with those of the previous

combination for benefit of producing shaped objects from established powder grain sizes.

For claim 28, further regarding a ceramic mold is formed taught as obvious by Lewis et al above, Lewis et al do not explicitly teach providing a surface in an inner region of the ceramic mold comprising a surface roughness different from an outer region of the ceramic mold. However, they do teach modifying surface roughness of the formed article (cl 21 lns 18-21 i.e. Rough surfaces might also be smoothed by laser ablation, using the laser in a pulsed mode to remove small amounts of material, or by passing the laser beam over the surface in order to melt a very thin surface layer) and it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a surface in an inner region of the ceramic mold comprising a surface roughness different from an outer region of the ceramic mold.

3. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deckard, further in view of Sachs et al, further in view of Lewis et al, and further in view of Loschau (Ceramics: Getting into the 2000's, already of record).

The previous combination does not teach at least one of the powder mixes comprises at least one ingredient that affects densification and/or sintering of the powder by producing a liquid phase for at least one of the regions of the object.

However, in the same field of endeavor pertaining to producing ceramic objects by laser sintering, Loschau teaches the ceramic powder comprises at least one ingredient that affects densification and/or sintering of the ceramic powder by producing a liquid phase for at least one of the regions of the object (pg 568 paragraph 1 i.e.

Experiments are known on indirect laser sintering of Al2O3 and SiC with low-melting binder…).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Loschau with those of the previous combination for benefit of using more complex mixtures that would impart certain targeted properties to the produced ceramic object.

Response to Arguments

Applicants' arguments filed 11/13/09 were fully considered and are not persuasive.

First, Applicant asserts that Sachs et al. merely teaches that two types of powder "can be applied via two or more separate powder dispersion heads so as to deposit the different powders at different regions of the part being formed" (col. 11, lines 16-20), and Sachs et al. fails to disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, as contended by the Examiner. Instead, Sachs et al. discloses that a second powder mix should be applied through a second dispersion head, onto the surface of a component, and accordingly, none of the cited prior art references, alone or in combination, disclose the step of forming a second region of the shaped object integral with the first region by a second laser sintering of the second powder mix, and accordingly, amended independent claim 17 is patentable. Examiner, however, points out that as stated in the claim 17 rejection above, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a second region of

the shaped object integral with the first region by a second laser sintering of the second powder mix, since one having ordinary skill in the art at the time the invention was made would recognize this limitation as nothing more than the duplication of parts for a multiple effect and could seek the benefit of producing shaped objects with regions formed of different materials. Please see MPEP 2144.04 (VI) and In re Harza, 274 F.2d 669, 671, 124 USPQ 378, 380 (CCPA 1960) for further details.

Second, Applicant asserts that Examiner's suggested modification of Deckard would involve removing the powder 22 from the confinement structure 28 and inserting the powder 22 within a dispersion head, to be deposited onto the surface of a component, along with a second powder being similarly deposited onto the surface of the component, from a second dispersion head, and Examiner's suggested modification of Deckard would eliminate the laser 12, optics, and thus the sintering process disclosed in Deckard, thereby destroying the purpose of Deckard, as the cited teaching in Sachs et al. specifically teaches that the first and second powder are to be individually applied from separate dispersion heads. Thus, even if the Examiner's suggested modification of Deckard was obvious, it would fail to disclose the step of forming a first/second region of the shaped object by a first/second laser sintering of the first/second powder mix, as recited in amended independent claim 17. Examiner, however, does not agree that the suggested modification of Deckard would necessitate removing the powder 22 from the confinement structure 28 and inserting the powder 22 within a dispersion head or would eliminate the laser 12, optics, and thus the sintering process disclosed in Deckard, thereby destroying the purpose of Deckard. A

fundamental concept of Deckard is the build up of a part in a layer-by-layer manner, and Deckard teaches a portion of powder 22 is deposited in the target area 26 and selectively sintered by the laser beam 64 to produce a sintered layer (cl 5 lns 55-67). Further, the powder dispenser 14 is supplied by a hopper 20 (cl 4 lns 40-41). Since Sachs et al. teaches that the first and second powders are individually applied from separate dispersion heads, another dispersion head would be added for the second powder. Clearly, one of ordinary skill would also, while depositing the first and second powders of a layer, move the dispersion heads in such a way so as not to interfere with the performance of the laser, optics, and thus the sintering process.

Third, Applicant asserts that Lewis et al. merely disclose that one object of the invention is "to produce articles having variable density" (col. 4, lines 20-21) and that density of an article may vary with laser power and/or a feed rate of powder which is melted by the laser (col. 21, lines 14-22), and Lewis et al. does not describe a sintering process, but only a melting process because sintering is a method for making objects from powder by heating the powder to below its melting point until its particles adhere to each other, and in contrast, the unmelted powder of Lewis is collected and returned to the powder container for reuse (col. 7, lines 38-40). Powder particles which are not completely melted by the laser energy are melted by the heat of the molten pool of material (col. 5, lines 64-67), and even if a particle remains somewhat unmelted within the pool, there is no evidence in Lewis or basis for a conclusion that any sintering of powder occurs, since the molten pool is controlled to be small and the re-solidification of the pool occurs quickly as the laser moves along the tool path (Lewis col. 6, lines 8-28).

Indeed, neither the cited portions of Lewis et al, nor any portion thereof, discloses that the respective first/second laser sintering is controlled to provide different material properties in the first and second regions of the shaped object, as recited in amended independent claim 17. Examiner, however, points out that as stated in the claim 17 rejection above, Lewis et al teach decreasing laser power results in less melting of the powder, thus reducing density (cl 22 lns 1-8). Therefore, it is inherent that powder particles not melted adhere to each other. Further, Examiner maintains that Lewis et al teach the forming of at least one of the first and second regions comprises controlling the respective laser sintering step to provide different material properties in the first and second regions of the shaped object (cl 4 lns 20-21 i.e. Another object is to produce articles having variable density, and cl 22 lns 1-8 i.e. Decreasing laser power results in less melting of the powder, thus reducing density, and cl 21 lns 14-22 i.e. It is expected that smoother surfaces will be attained by use of powder of smaller size and by reducing the size of the powder spot. Rough surfaces might also be smoothed by laser ablation, using the laser in a pulsed mode to remove small amounts of material, or by passing the laser beam over the surface in order to melt a very thin surface layer). Examiner points out that as densification is controlled it is inherent that porosity is also controlled and vice versa.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES SANDERS whose telephone number is 571-270-7007. The examiner can normally be reached on Monday through Friday, 8 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Del Sole can be reached on 571-272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMS

/Joseph S. Del Sole/

Supervisory Patent Examiner, Art Unit 1791